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ABSTRACT

This study investigated relationships between open education and curiosity behavior of students enrolled in different types of school programs. The Non Verbal Curiosity Test (designed and validated for the study) was used to measure subjects' curiosity, since it considers quantitative and qualitative aspects of curiosity behavior. Subjects (N=237) were 11-year olds in six Ontario parochial schools. Openness of the school program was assessed with information collected from teachers in the Dimensions of Schooling Questionnaire (DISC). Analysis of results indicates that openness of program was not significantly related to children's curiosity behavior. A curvilinear distribution for curiosity and openness of program was obtained, similar to the distribution postulated by Berlyne for cognitive conflict and specific curiosity. This similarity is the basis for discussion. It is concluded that the tentative evidence obtained raises some questions as to whether open programs necessarily enhance curiosity behavior. It is suggested that a moderate level of program openness may be the optimum environment for fostering curiosity. (DP)

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Curiosity and Openness: Empirical Testing of a Basic Assumption [1]

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At the heart of the open education movement, there are several key assumptions about how children develop and learn. In a treatise on open education Barth (1969) claimed that the development and enhancement of curiosity in children was the key to further learning. He put forth the following assumptions which are pertinent to curiosity:

1. children are innately curious and display curiosity behaviour quite independent of adult intervention;
2. exploratory behaviour is self perpetuating;
3. active exploration in a rich environment offering a wide array of manipulative materials will facilitate children's learning.

These assumptions presented by Barth suggest that all children will learn if given the freedom to manifest their innate curiosity. However, Barth offers little empirical information as to the validity of such an assumption. Further, Barth has offered no suggestion or rationale as to the mediating processes whereby curiosity might lead to further learning.

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A review of the available literature in the social sciences supports the lack of empirical and theoretical justifications for these assumptions. Although there is an extensive body of research and theory illustrating the role of curiosity in learning (Berlyne, 1954, 1960, 1965, 1970. Maw & Maw, 1964, 1970, 1971. McReynolds, 1961, 1971. Day, 1967, 1968, 1971.), little of this research has been directly concerned with education. In addition, the research literature reveals a paucity of studies on the relationship between open education and such student characteristics as curiosity. Finally, research on curiosity has been hampered by the problems inherent in measuring this construct, particularly as it relates to educational considerations.

[1] Paper presented at the Annual Conference of the American Educational Research Association, New Orleans, February, 1973.

This paper reports on a study which investigated the relationships between open education and curiosity behaviour of students enrolled in different types of open school situations. Open education was defined in two ways: programmatically and architecturally. Our major concern is with open education as a type of school program, i.e., a strategy for influencing the cognitive, connative, and affective development of children. Architecturally open is a term used to refer to a school design marked by the absence of classroom walls. Curiosity was defined as the behaviour manifested as a result of a need to extend one's knowledge into unusual, novel, complex, and/or incongruous aspects of the environment in the absence of a clearly defined goal or outcome. This definition is consistent with the definition of specific curiosity suggested by Berlyne (1954).

The Study

Instrumentation

Valid measures are important ingredients in a study of two such elusive constructs as curiosity and open education. With regard to curiosity, it was decided that a comprehensive approach to its measurement must be taken. This involved ascertaining both the quality and quantity of curiosity behaviour manifested in novel situations. Since most of the existing measures involved only pencil and paper inventories asking the child to state a preference for the novel, a task oriented instrument, the Non Verbal Curiosity Test (known as the NVC) was designed following a model for a series of sequential components of non verbal curiosity behaviour (manipulatory exploratory behaviour) established by Peterson (1969), and following the Gagné model for the sequential development of a specific behaviour pattern (Gagné, 1965).

The NVC consists of six pairs of tasks with one member of each pair requiring curiosity behaviour and the other requiring non-curiosity behaviour. Subjects were requested to choose the one member of each

pair he/she most wanted to do, and then complete the task. The curiosity task of each pair includes a novel, strange, incongruous and, or complex situation for which a minimum of instruction and no evidence of expected outcome is provided.

The non-curiosity task includes a comparatively rote familiar task with clear, concise instructions and a clearly expected outcome. It is allotted a clearly defined external reward such as bubble gum, small candy, or a penny, in order to compensate for the intrinsically rewarding curiosity task. It was thought that these types of rewards were analogous to the stress on marks and grade promotion of the traditional type of school and the intrinsic value of learning supposedly found in open education schools.

The tasks on the NVC involve primarily manipulative operations related to learning, such as numerical skills, reading and word manipulation skills, and the ability to see relationships for concept building. Topics covered by the curiosity tasks include word and number sequence problems, social relationship problems, scientific phenomena, puzzles, and creative operations with common paper materials.

The quality of the curiosity behaviour was measured by a five point rating scale for each item, which involved several sequential steps of curiosity, i.e., approaching the novel situation, utilizing various sensory modalities, manipulating the object, and perseverance. The NVC has undergone pilot testing and validation efforts. A correlation coefficient of .54 obtained between the NVC and teacher ratings of curiosity was significant at the .05 level. A reliability estimate of .56 was obtained using coefficient alpha, a respectable result for a six item test. Information about the undimensionality of the NVC can be found in Corlis (1972).

Openness of school program was determined by the Dimensions of Schooling Questionnaire (hereafter referred to as DISC), an instrument developed and validated in connection with an extensive research project on open education at OISE (of which this study is a part). DISC was designed to secure information from teachers about 28 dimensions of school and classroom life hypothesized to be important in the implementation of open programs. These dimensions were part of a general set of categories which included the setting of instructional objectives, selecting materials and activities, environment for learning, structure for decision-making, time scheduling, composition of classes, role of teacher, student evaluation, and student control. The dimensions included in the instrument were identified from the literature on open education. (A fuller explication of the development and validation of DISC can be found in a recent article in Interchange by Traub, Weiss, Fisher and Musella (1972).) A school's program openness score was the mean of the teachers' scores for that school.

Design and Sample

The subjects used in the study were 237 eleven year olds in six schools from a county parochial school board in Ontario. Eleven year olds were chosen because the literature indicates that age to be optimum for manifesting curiosity behaviour (Mosher & Hornsby, 1966). The six schools were chosen from thirty schools in the same county where the DISC questionnaire was utilized. Specifically, schools with the extreme high and low DISC scores were selected for each of three different architectural types: open space, mixed space (open space addition to existing closed space building), and closed space (the traditional school building with classrooms). The design of the study was a 2 x 2 x 3 (sex x program x architecture) fixed effects model with unequal numbers of subjects in the cells. Two univariate analyses of variance with multiple contrasts were performed using different levels of program openness as one topic of contrast and different types of

architecture as the other. For economy of time the effects of sex and the interactions of sex with school characterisitcs will not be discussed here.

The Results

What are the relationships between curiosity and the school characteristics of program openness and architecture? Table one presents the results of the multiple contrasts for the main effects of high versus low DISC scores, open architecture versus closed architecture, and open architecture versus mixed architecture. The major contrast of interest to us, that for openness of program, was not significant. Of the three contrasts reported, the only significant value was obtained for open architecture versus mixed architecture. (This is a little difficult to interpret since each mixed architecture school had a different physical pattern. In one school the open addition was for the primary grades, while for the other school, the open addition was for the intermediate grades.)

In addition to the three major contrasts which involved the six schools, table one also includes simple, two school contrasts. Inspection of these data indicates that statistically significant differences were found for each contrast involving either of the extreme schools (i.e. open space, more open program; or closed spaced, less open program) with each of the remaining schools.

In order to gain a clearer picture of the relationships involving pairs of schools, we graphed the EVC scores in relation to the relative positions of the average DISC scores for the six schools in the study. Figure one presents the graph for these data. With a few minor deviations, this graph indicates a very interesting representation: curiosity behaviour scores are distributed in an inverted U-shaped distribution with respect to programme openess. The two schools which fall at the lowest points on the graph are the extreme schools in each direction: open archietcture - high open programme, and closed architecture - low open programme: the remaining four schools appear to have basically the same curiosity means. Put another way these results indicate that, at least for these six schools, higher levels of curiosity behaviour are associated with moderate amounts of programme openness.

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Table 1

Analysis of Variance Results of N.V.C. in 6 Schools Under Investigation

	Nonverbal Curiosity Test			
	df	MS	F Uni-Variate	P
ARCHITECTURE[1]				
OA vs. CA	1 & 225	27.9633	.5418	.4625
OA vs. MA	1 & 225	526.4673	10.2001	.0017**
OA: MOP vs LOP	1 & 225	274.9779	5.3276	.0219*
MA: MOP vs LOP	1 & 225	2.9975	.0581	.8098
CA: MOP vs LOP	1 & 225	428.3475	8.2992	.0044**
PROGRAM OPENNESS[2]				
MOP vs LOP	1 & 225	18.8016	.3643	.5468
MOP: OA vs MA	1 & 225	815.8278	15.8065	.0001***
MOP: OA vs CA	1 & 225	555.5015	10.7627	.0013**
LOP: OA vs MA	1 & 225	38.4549	.7431	.3896
LOP: OA vs CA	1 & 225	205.1058	3.9739	.0475*

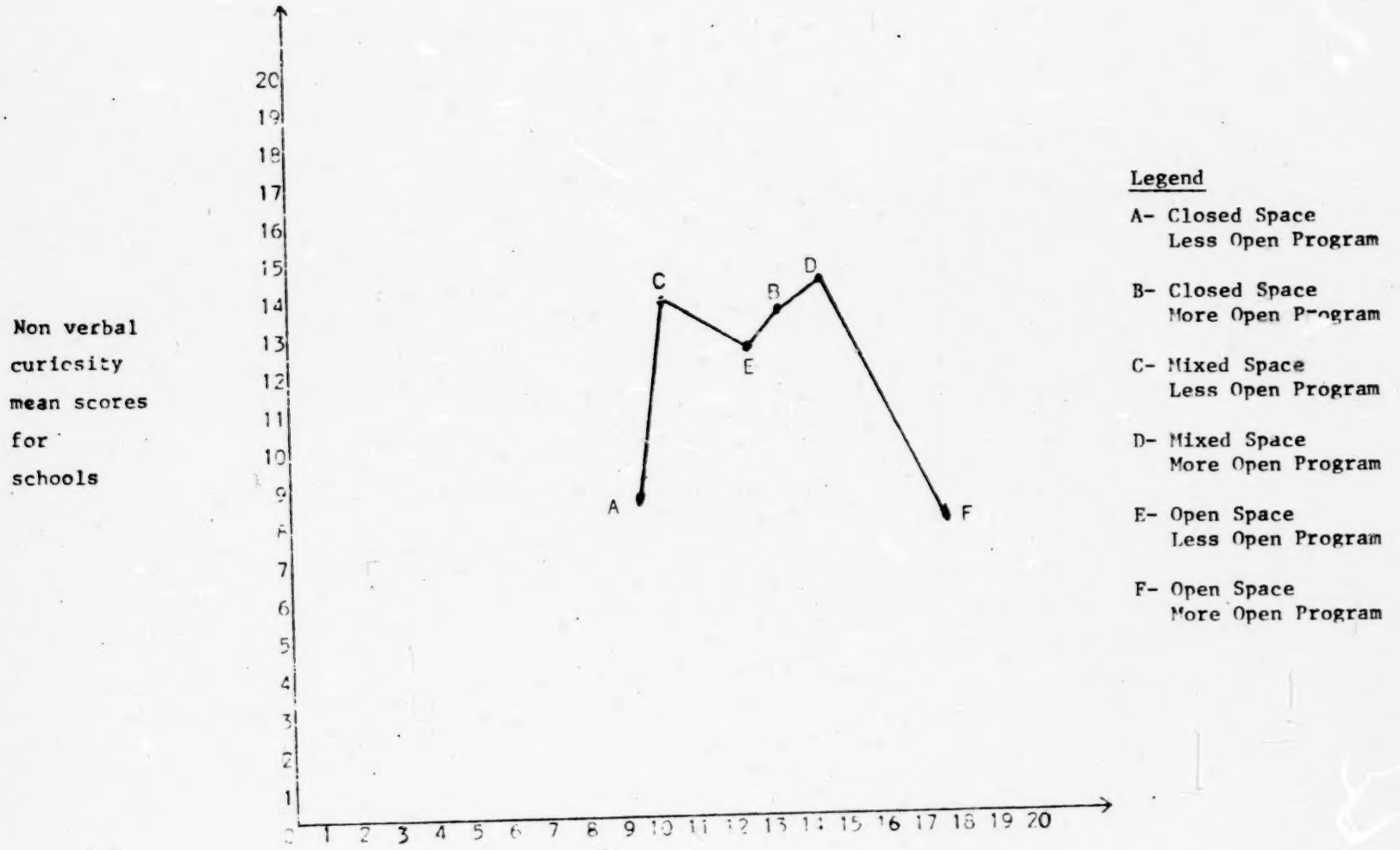
[1]OA = Open Architecture
MA = Mixed Architecture
CA = Closed Architecture

[2]MOP = More Open Program Scores on DISC
LOP = Less Open Program Scores on DISC

Figure 1

THE RELATIONSHIP OF PROGRAMME

OPENNESS AND CURIOSITY



DISCUSSION

Although we have no evidence about the generalizability of our results beyond the six schools of the study, one cannot help but notice the similarity between the obtained curvilinear distribution for curiosity and openness of programme and the curvilinear distribution postulated by Berlyne (1960) of cognitive conflict and specific curiosity. According to Berlyne, specific curiosity leading to information gathering results from conflict or uncertainty due to such properties as novelty, surprise, doubt, perplexity, contradiction, and bafflement inherent in the stimulus presented or encountered. This conflict may heighten arousal, leading to exploratory, information-seeking behaviour as a method of reducing the conflict. Berlyne (1960) has also pointed out that when such conflict is too intense, the individual may opt out of the conflict situation and cease to explore the alternatives in the conflict. Piaget too, (cited in Ginsburg and Opper, 1969) has suggested that this process of conflict reduction leading to exploration is highly relevant to learning. But he adds that if the conflict is too great or of a nature with which the individual cannot deal, the individual may either opt out of the conflict situation or oversimplify the problem or conflict due to a limited cognitive schemata and produce an erroneous answer. Bruner (1966) has also postulated that a child's curiosity is enhanced by the logical presentation of alternatives in the child's environment which may be synonymous with the generation of cognitive conflict in the learning environment. Bruner has further outlined that these alternatives should be presented logically and in increasing order of complexity as the child progresses through mastery of a task. Both Bruner (1966) and Piaget (Ginsburg and Opper 1969) have pointed out that direction too is essential for the curious child so that goals will emerge and curiosity will not take on a pattern of randomness.

The question then remains as to how this curiosity process is influenced by the concerns of open education. It is possible that extreme open programme situations may provide the child with more alternatives than she/he is ready to handle, and with more complex tasks than she/he can cope, thus generating diminished curiosity behaviour in the child. Further, the results for the most traditional school (i.e. closed space - less open programme) indicate that there may not be enough alternatives available for students in that situation and that the tasks encountered are not sufficiently stimulating to the student, which may then lead to decreased exploratory behaviour.

Conclusions:

This study has presented some very tentative empirical evidence related to several key assumptions about curiosity behaviour and open education and has offered some challenge to basic assumptions in the open education rationale. The data presented raise some questions as to whether open programmes necessarily enhance curiosity behaviour and suggest that a moderate level of programme openness may be the optimum environment for fostering curiosity behaviour, and as a consequence further learning.

It might be suggested that the dimensions of programme thought to be related to moderate openness are:

1. Fewer materials with careful selection as to level of complexity and logical presentation of alternatives in the materials as opposed to a vast array of materials randomly presented from which the child may select as he/she chooses.

2. Guidance provided for the child as he/she explores new materials so that goals will emerge for the exploring child as opposed to providing new materials with relatively little guidance.

To date there are no data on these possible factors thought to contribute to moderate openness in school programme. Perhaps as further research is conducted to determine the role of these and other factors on openness of educational approach, we will become more confident about the nature of the assumptions investigated in this study. Indeed, evidence is necessary related to other assumptions of open education that have not been addressed in this paper. It is through this process of systematic research efforts that some of the mysteries of open education will be revealed.

CHAPTER 9

Bibliography

Barth, R.S. "Open Education: Assumptions and Rationale." Unpublished Qualifying Paper, Harvard University, 1969.

Barth, R.S. "When Children Enjoy School: Some Lessons from Great Britain." Childhood Education, 1970, 46, 195-200.

Berlyne, D.E. "A Theory of Human Curiosity." British JOurnal of Psychology, 1954, (a) 45, 180-191.

Berlyne, D.E. "An Experimental Study of Human Curiosity." British Journal of Psychology, 1954, (b), 45, 256, 265.

Berlyne, D.E. Conflict Arousal and Curiosity. New York: McGraw-Hill Book Co., 1960.

Berlyne, D.E. "Exploratory and Epistemic Behaviour." Psychology: A Study of A Science. Edited by S. Koch. Vol. V. New York: McGraw-Hill Book Co., 1963.

Berlyne, D.E. "Curiosity and Education." Learning and the Educational Process. Edited by R. Krimboltz. Chicago; Rand McNally Co., 1965 (a).

Berlyne, D.E. Structure and Direction in Thinking. New York: John Wiley & Sons Inc., 1965 (b).

Berlyne, D.E. "Learning and Reasoning in Children." Carmichael's Manual of Child Psychology. Edited by P.H. Mussen. Vol. 1, New York: John Wiley & Sons Inc., 1970.

Bruner, J.S. "The Course of Cognitive Growth." American Psychologist, 1964, 19, 1-15.

Bruner, J.S. Toward a Theory of Instruction. Cambridge, Mass: Harvard University Press, 1966.

Bruner, J.S. The Process of Education. Cambridge, Mass: Harvard University Press, 1960.

Bruner, J.S. "On Cognitive Growth II." Human Development and Cognitive Processes. Edited by J. Eliot, New York: Holt, Rinehart & Winston Inc., 1971.

Bussis, A.M. & Crittenden, E.R. Analysis of an Approach to Open Education. Project Report PR-70-13, Educational Testing Service, Princeton, New Jersey, 1970.

Cooley, W.W. & Lohnes, P. R. Multivariate Data Analysis. New York: John Wiley & Sons Inc., 1971.

Corlis, C. The Differential Effects of Open & Closed Schooling Systems on Curiosity Behaviour Manifested in Elementary School Children. Unpublished Master's Thesis. University of Toronto, 1972.

Day, Hy. "Effects of Increased Arousal on Attention in High and Low Anxious Subjects". Ontario Journal of Educational Research, 1966-67, 185-91.

Day, Hy. , "Evaluations of Subjective Complexity, Pleasingness, and Interestingness for a Series of Random Polygons Varying in Complexity." "Perception and Psychophysics, 1967, 2, 281-286.

Day, Hy. "Role of Specific Curiosity in School Achievement." Journal of Educational Psychology, 1968, 59, 37-45.

Day, Hy. "The Measurement of Specific Curiosity." Intrinsic Motivation: Edited by Hy Day, D.E. Berlyne & D. Hunt, Toronto: Holt Rinehart & Winston of Canada Ltd., 1971.

Finn, Jeremy. Multivariance: A Fortran IV Program. Toronto: Ontario Institute for Studies in Education Publications, 1968.

Flavell, J. The Developmental Psychology of Jean Piaget. New York: D. Van Nostrand Co., 1964.

Gagné, R.M. The Conditions of Learning, Second Edition. New York: Holt Rinehart, & Winston Inc., 1965.

Ginsburg, H. & Opper, S. Piaget's Theory of Intellectual Development, Englewood Cliffs, New Jersey: Prentice-Hall Inc., 1969.

King, Joan. "Curiosity in Young Children." Unpublished Doctoral Dissertation, University of Colorado, Denver, 1969.

Kohl, H.R. The Open Classroom. New York: A New York Review Book, Vintage Books, 1969.

Langevin, R. "A Study of Curiosity, Creativity, and Intelligence." An Unpublished Doctoral Dissertation, University of Toronto, 1970.

Lore, R.K. "Some Factors Influencing The Child's Exploration of Visual Stimuli." Unpublished Doctoral Dissertation, University of Tennessee, 1965.

Lord, F. & Novick, M. Statistical Theories of Mental Test Scores. Reading, Mass: Addison - Wesley Publishing Co., 1968.

Lumsden, James. "The Construction of Unidimensional Tests." Psychological Bulletin, 1961, 58, 122-131.

Maw, W.H. & Maw, E.W. An Exploratory Investigation into the Measurement of Curiosity in Elementary School Children. ERIC Reports, C.R.P. No. 801, University of Delaware, Newark, Delaware, 1964.

Maw, W.H. & Maw, E.W. "Self Concepts of High and Low Curiosity Boys." Child Development, 1970, 41, 123-129.

Maw, W.H. "Difference in the Personality of Children, Differing in Curiosity." Intrinsic Motivation, Edited by Hy Day, D.E. Berlyne, & D. Hunt, Toronto: Holt, Rinehart & Winston of Canada, Ltd. 1971.

McReynolds, P., Acker, M. & Pietia, C. "Relation of Object of Curiosity to Psychological Adjustment." Child Development, 1961, 32, 393-400.

McReynolds, P. "The Three Faces of Cognitive Motivation." Intrinsic Motivation. Edited by Hy Day, D.E. Berlyne, & D. Hunt, Toronto: Holt, Rinehart, & Winston of Canada Ltd., 1971.

Mosher, F.A. & Hornsby, J.R. "On Asking Questions." Studies in Cognitive Growth. Edited by J.S. Bruner, New York: John Wiley & Sons Inc., 1966.

Mulaik, S.A. The Foundations of Factor Analysis. New York: McGraw Hill Book Co., 1972.

Penney, R.K. & McCann, B. "The Children's Reactive Curiosity Scale." Psychological Reports, 1964, 15, 323-334.

Peterson, Ruth. "Indentification and Analysis of Some Aspects of Exploratory Behaviour (Curiosity) in Elementary School Children." Unpublished Doctoral Dissertation, University of California, Berkeley, 1969.

Piaget, J The Psychology of Intelligence. London: Routledge & Kegan, Paul, 1950.

Piaget, J Biology and Knowledge. Chicago: The University of Chicago Press, 1971.

Traub, R. E., Weiss, J., Fisher, C. and Musella, D. et al. "Closure on Openness: Describing and Quantifying Open Education." Interchange, 3(Nos. 3/3), 1972, 69-84.

Wilson, F.S., Langevin, R. & Stuckey, T. Are Pupils in the Open Plan School Different. Research Paper presented at the Eleventh Canadian Conference on Educational Research, Victoria, B.C., 1969.

Winer, B.J. Statistical Principles in Experimental Design. New York: McGraw-Hill Book Co., 1962.